

Infrared Observations of Planetary Atmospheres

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a. The goal of this research is to obtain infrared data on planetary atmospheres which provide information of several aspects of structure and composition. Observations include direct mission real-time support as well as baseline monitoring preceding mission encounters. Besides providing a broader information context for spacecraft experiment data analysis, observations will provide the quantitative data base required for designing optimum remote sensing sequences evaluating competing science priorities.

b. In the past year, thermal images of Jupiter and Saturn were made near their oppositions in order to monitor long-term changes in their atmospheres. Infrared images of the jovian polar stratospheric hot spots were made with IUE observations of auroral emissions. An exploratory 5-micron spectrum of Uranus was reduced and accepted for publication. Simultaneous measurements of CH₄ and CH₃D will have been made (July 1988) to determine this ratio in Neptune's atmosphere. An analysis of time-variability of temperature and cloud properties of the jovian atmosphere was made and submitted for publication in a NASA SP. Development of geometric reduction programs for imaging data was initiated for the Sun workstation. Near-infrared imaging observations of Jupiter were reduced and a preliminary analysis of cloud properties made. The first images of the full disk of Jupiter with a near-infrared array camera were acquired. Narrow-band (10 cm⁻¹) images of Jupiter and Saturn were obtained with acousto-optical filters.

c. During the next year, monitoring of Jupiter and Saturn will continue with correlative visible and ultraviolet work. Observation of Uranus and Neptune at higher spectral resolution in the 7- to 17-micron region will be attempted in selected spectral regions to determine compositional constraints. Calibration of central meridian scans of Jupiter will be finished and of images of Jupiter and Saturn initiated. Observations will continue in the near-infrared region with the JPL imaging spectro-polarimeter, concentrating on the disk of Saturn.

d. Publications are shown on the next page.

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Publications

Reviewed Contributions:

- G. Orton, D. Aitken, P. Roche, C. Smith, J. Caldwell and R. Snyder 1987. The spectra of Uranus and Neptune at 7-14 and 17-23 microns. *Icarus* 70, 1-12.
- R. Halthore, J. Caldwell, G. Orton, and J. Bergstralh 1988. Infrared polar brightening on Jupiter IV. Spatial properties of methane emission. *Icarus* 74, 331-339.
- R. F. Beebe, G. S. Orton , and R. A. West. 1988. Time-variability of clouds and temperatures: An observational perspective. In *Time-Variable Phenomena of The Jovian System*. (Belton, Hunt, and West, Eds.) NASA Special Publication.
- G. S. Orton and C. D. Kaminski 1987. An exploratory 5-micron spectrum of Uranus. *Icarus*. In press.

Abstracts:

- Baines et al. 1987. Stratospheric aerosols in the Great Red Spot and South Polar Region on Jupiter. *Bull. Amer. Astron. Soc.* 19. 827.
- G. S. Orton and C. D. Kaminski 1987. The low-resolution 5-micron spectrum of Uranus. *Bull. Amer. Astron. Soc.* 19, 852.